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EVALUATION OF THE CONDITION OF THE VESTIBULAR APPARATUS IN GUIN--ETC(U)
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EVALUATION OF THE CONDITION OF THE VESTIBULAR
APPARATUS IN GUINEA PIGS EXPOSED TO INDUSTRIAL
NOISE DURING INTRAUTERINE LIFE

by

Teresa Daniel



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EVALUATION OF THE CONDITION OF THE VESTIBULAR
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by

Teresa Daniel

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Director: Docent J. Laciak, dr.hab.med.

The article provides an evaluation of the vestibular apparatus in a group of 15 young, 30 day-old guinea pigs, who were exposed to industrial noise during intrauterine life. 10 young, 30 day-old guinea pigs of a control group were studied at the same time.

The harmful effect of noise on the body, involving not only the organs of hearing, but other organs and systems as well (2, 10) is indisputable. The effect of noise on hearing and on the vestibular apparatus is known, but the majority of authors have been concerned with the evaluation of hearing. A number of articles, however, do provide descriptions of complaints that are the consequence of the effect of noise on the vestibular apparatus (4, 7, 11, 13). In experimental studies, changes in the ENG that occur under the influence of an increase in sound pressure have been observed in the form of an increase in the reaction of the labyrinths with amplitude of the the nystagmus and angular velocity of the slow phase, as well as the reaction of the labyrinths as a function of exposure time to noise (5). There are not many articles in the bibliography that discuss the consequences of noise acting on a fetus within the mother's womb, which during the gestation period was exposed to the effect of industrial noise (8, 12). Of the papers dealing with this subject, all of them treat hearing, while the final conclusions vary depending on the experimental method, especially in terms of exposure duration and sta-

tistical ^{uniformity} ~~synonymity~~ of the obtained results. The present work ^{will} ~~has~~ ~~decided to~~ investigate the condition of the vestibular apparatus in young guinea pigs, who were exposed to the noise of a weaving mill through their entire period of intrauterine life.

MATERIALS AND METHODS

From a group of 100 young guinea pigs, given birth to by mothers that had been exposed to the noise of a weaving mill during gestation, 15 individuals were selected at random of the 30 day-old animals in order to conduct experiments on the efficiency of the vestibular apparatus. The evaluation of the vestibular apparatus was performed with the aid of an ENG. Recording of the rotary nystagmus obtained from a value of 90° s during an angular acceleration of 6° s on the right and left side, was achieved using an electronic chair from the Tönnies company. The method of ENG studies in experimental animals proposed by Latkowski (6) was used in the work.

The females were exposed to noise during the entire gestation period - 8 hours daily for 5 days a week, 6 hours on Saturday with a rest on Sunday. The noise emitted in the animal compartment was recorded beforehand in the weaving mill room that would house the animals. The exact acoustic conditions for the experiment were provided by the author in another study (3). In the majority of newborn guinea pigs in five consecutive experiments performed between the 3rd and 60th day of life, the hearing impairment was determined. The hearing test was conducted with a audiometer of Polish design, the Elza AUG-64-a, based on Preyer's conchal reflex. All of the animals that underwent electronystagmometric tests exhibited distinct hearing defects. The control group comprised 10 young, 30 day-old guinea pigs who were never exposed to noise.

TEST RESULTS

Group I. 15 30 day-old guinea pigs who were exposed to the noise

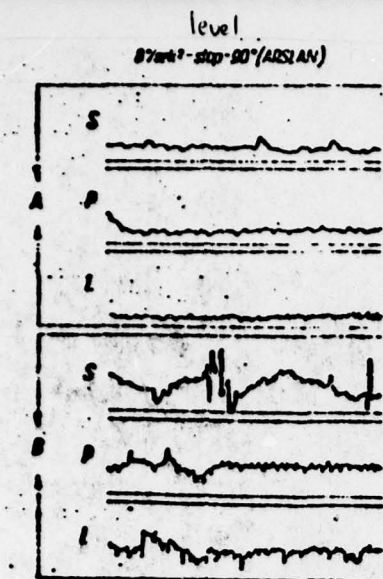


Fig. 1. Electronystagmograms of selected guinea pigs: A - from the experimental group, B - from the control group. S - ^{rest} silence, P - right labyrinth response, L - left labyrinth response.

of the weaving mill during intrauterine life. With the ENG test (docent B. Latkowski, dr.hab. med.) the typical intrinsic nystagmus was not found, the curves during ^{rest} silence, however, did bear the character of nystagmoidal motions or ^{swimming} motions of the eyeballs. This second phenomenon was very frequent, which, as follows from the bibliography, is characteristic for this group of animals (1, 9). In eight guinea pigs from this group we found a very significant impairment in the vestibular apparatus on both sides, a marked reduction in amplitude and a number of deflections in the rotary nystagmoidal reaction (Fig. 1A). In addition, in three guinea pigs complete lack of response was found. In almost every case the typical vestibular reaction was replaced by the central component, which was expressed by sudden turns of the eyeballs to the right or left. A reaction of the vestibular nystagmus with clearly marked asymmetry was found in four guinea pigs in which the characteristics of the recording on the one hand, bore the characteristics of vestibular excitation with a clearly marked rapid and slow phase, and on the other hand, bore the features of impairment with the characteristic nystagmoidal motions, in which it was difficult to find a rapid and slow phase.

Group II. 10 young 30 day-old guinea pigs who were never exposed to noise. In all of the guinea pigs in this group nystagmoidal motions ^{at rest} in silence (Fig. 1B) were found. In seven cases rotary nystagmus occurred following rotary excitation, which within the range of parameters

chosen (number of deflections, amplitude) displayed a symmetrical reaction for the right and left side. In two cases a distinct asymmetry was found, and in one case a total absence of response to angular acceleration. Fig. 1 depicts characteristic recordings on the ENG for groups I and II.

DISCUSSION OF RESULTS AND CONCLUSIONS

Hearing impairment was found in the experimental group in all 15 young guinea pigs using an audiometric test. With the ENG test, we observed in both groups the occurrence of nystagmoidal motions or ^{swimming} motions of the eyeballs, which must be attributed to the central component. In group I (experimental) a marked predominance of individuals occurs with impairment of the vestibular apparatus on both sides, or with distinct asymmetry. Such features are encountered sporadically in group II (control). Both the type of hearing impairment as well as the nature of the electronystagmographic recording suggest that in guinea pig fetuses that are exposed to the noise of a weaving mill during intrauterine life, impairment of hearing and of the vestibular apparatus occurs as a consequence of the harmful action of industrial noise.

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